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The ISO View of Star Forming Galaxies

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ISO studies of normal galaxies in the local Universe have revealed basic new properties whose significant implications for the star formation process and cosmology are only starting to be understood. This review will touch on the general results of a statistical nature, and provide a quick summary of the profusion of exciting results on individual objects.

In the mid-infrared, PHT-S has established that the spectra of star forming galaxies between 6 and 13um are dominated by the Aromatic Features in Emission (AFE), and show little variation as a function of the heating intensity. The Carriers of the AFE (CAFE) are thus a universal component of dust with standard properties, and contribute between 10 and 25% of the total dust luminosity. In addition to AFE, the spectra show a low-level continuum detectable at wavelengths longer than 3.5um whose origin is still under investigation.

The mid-infrared colors formed as the ratio of flux densities in the 6.75um and the 15um bands of ISO-CAM remain essentially constant and near unity for quiescent and mildly active galaxies. As dust heating increases further, the 15um flux increases steeply compared to 6.75um, indicating that dust heated to 100K<T<200K becomes a significant component. Such hot dust is presumably located within or just outside HII regions. At the other end of the spectrum, photometry at 120-200um using ISO-PHOT is starting to constrain the distribution of dust temperatures at the low end of the temperature scale.

From LWS data, the far-infrared fine-structure lines of [CII] and [OI], which provide most of the cooling for warm atomic gas, show variations that have remained controversial in their interpretation. In particular, as the galaxy become more active in star formation, its [CII] flux weakens relative to total dust emission while the [OI] does not. This behavior has attracted much interest because it extrapolates to the most active galaxies, making them weaker in [CII] than previously expected. Several explanations for the effect have been advanced, and will be discussed in this review. Spectroscopy with SWS has measured molecular hydrogen in galaxies, providing a powerful handle on the warm molecular gas content. SWS and CAM-CVF studies targeting ionic fine-structure lines have demonstarted their value as diagnostics of the radiation field.
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